

## CLAIMS

What is claimed is:

- 5           1.       A method for imaging an organ, comprising the steps of:  
              acquiring a set of motion data for two or more organs from at least one of one or  
              more types of electrical sensors and one or more types of non-electrical sensors;  
              processing the set of motion data to extract two or more prospective gating  
              points for an organ of interest; and  
10           acquiring a set of image data representative of the organ of interest using the two  
              or more prospective gating points.
2.       The method, as recited in claim 1, further comprising the steps of:  
              reconstructing the set of image data to generate a set of reconstructed data; and  
15           generating an image from the set of reconstructed data.
3.       The method, as recited in claim 2, wherein generating the image comprises  
              fusing a set of image data representative of structure with at least one of a set of image  
              data representative of motion and a set of image data representative of electrical activity.  
20           4.       The method, as recited in claim 1, wherein at least one of the electrical sensors  
              and the non-electrical sensors are activated in accordance with a set of positional data  
              acquired by one or more positional sensors.
5.       The method, as recited in claim 1, wherein each type of electrical sensor  
25           comprises two or more electrical sensors of the type.
6.       The method, as recited in claim 1, wherein each type of non-electrical sensor  
              comprises one or more non-electrical sensors of the type.

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7. The method, as recited in claim 1, wherein the set of motion data is at least partially acquired from a set of pre-acquisition image data.

8. A method, for imaging an organ, comprising the steps of:

5 acquiring a set of motion data for one or more organs from at least two of one or more types of electrical sensors and one or more types of non-electrical sensors;

processing the set of motion data to extract two or more prospective gating points for an organ of interest; and

10 acquiring a set of image data representative of the organ of interest using the two or more prospective gating points.

9. The method, as recited in claim 8, further comprising the steps of:

reconstructing the set of image data to generate a set of reconstructed data; and  
generating an image from the set of reconstructed data.

15 10. The method, as recited in claim 9, wherein generating the image comprises fusing a set of image data representative of structure with at least one of a set of image data representative of motion and a set of image data representative of electrical activity.

20 11. The method, as recited in claim 8, wherein at least one of the electrical sensors and the non-electrical sensors are activated in accordance with a set of positional data acquired by one or more positional sensors.

25 12. The method, as recited in claim 8, wherein each type of electrical sensor comprises two or more electrical sensors of the type.

13. The method, as recited in claim 8, wherein each type of non-electrical sensor comprises one or more non-electrical sensors of the type.

30 14. The method, as recited in claim 8, wherein the set of motion data is at least partially acquired from a set of pre-acquisition image data.

15. A computer program, provided on one or more computer readable media, for imaging an organ, comprising:

5 a routine for acquiring a set of motion data for two or more organs from at least one of one or more types of electrical sensors and one or more types of non-electrical sensors;

a routine for processing the set of motion data to extract two or more prospective gating points for an organ of interest; and

10 a routine for acquiring a set of image data representative of the organ of interest using the two or more prospective gating points.

16. The computer program, as recited in claim 15, further comprising:

a routine for reconstructing the set of image data to generate a set of reconstructed data; and

15 a routine for generating an image from the set of reconstructed data.

17. The computer program, as recited in claim 16, wherein the routine for generating the image fuses a set of image data representative of structure with at least one of a set of image data representative of motion and a set of image data representative of electrical activity.

18. The computer program, as recited in claim 15, wherein the routine for acquiring the set of motion data activates at least one of the electrical sensors and the non-electrical sensors in accordance with a set of positional data acquired by one or more positional sensors.

19. The computer program, as recited in claim 15, wherein the routine for acquiring the set of motion data acquires at least part of the set of motion data from a set of pre-acquisition image data.

20. A computer program, provided on one or more computer readable media, for imaging an organ, comprising:

5 a routine for acquiring a set of motion data for one or more organs from at least two of one or more types of electrical sensors and a one or more types of non-electrical sensors;

a routine for processing the set of motion data to extract two or more prospective gating points for an organ of interest; and

a routine for acquiring a set of image data representative of the organ of interest using the two or more prospective gating points.

10 21. The computer program as recited in claim 20, further comprising:

a routine for reconstructing the set of image data to generate a set of reconstructed data; and

a routine for generating an image from the set of reconstructed data.

15 22. The computer program as recited in claim 21, wherein the routine for generating the image fuses a set of image data representative of structure with at least one of a set of image data representative of motion and a set of image data representative of electrical activity.

20 23. The computer program as recited in claim 20, wherein the routine for acquiring the set of motion data activates at least one of the electrical sensors and the non-electrical sensors in accordance with a set of positional data acquired by one or more positional sensors.

25 24. The computer program, as recited in claim 20, wherein the routine for acquiring the set of motion data acquires at least part of the set of motion data from a set of pre-acquisition image data.

25. An imaging system comprising,  
an imager configured to generate a plurality of signals representative of a region  
of interest;

data acquisition circuitry configured to acquire the plurality of signals;

5 data processing circuitry configured to receive process the plurality of signals;

system control circuitry configured to operate at least one of the imager and the  
data acquisition circuitry;

an operator workstation configured to communicate with the system control  
circuitry and to receive the processed plurality of signals from the data processing  
10 circuitry; and

a sensor-based motion measurement system configured to measure electrical or  
non-electrical activity indicative of the motion of two or more organs within the region  
of interest.

15 26. The imaging system as recited in claim 25, further comprising one or more  
positional sensors configured to activate one or more non-electrical sensors for the  
sensor-based motion measurement system based on the position of the one or more non-  
electrical sensors relative to the imager.

20 27. The imaging system as recited in claim 25, further comprising one or more  
positional sensors configured to activate two or more electrical sensors for the sensor-  
based motion measurement system based on the position of the two or more electrical  
sensors relative to the imager.

25 28. The imaging system as recited in claim 25, wherein the sensor-based motion  
measurement system is configured to measure electrical activity indicative of the motion  
of two or more organs via two or more electrical sensors.

30 29. The imaging system as recited in claim 25, wherein the sensor-based motion  
measurement system is configured to measure non-electrical activity indicative of the  
motion of two or more organs via one or more non-electrical sensors.

30. The imaging system as recited in claim 29, wherein the one or more non-electrical sensors comprise accelerometers, optical markers, displacement sensors, force sensors, ultrasonic sensors, strain gauges, photodiodes, and pressure sensors.

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31. An imaging system comprising,  
an imager configured to generate a plurality of signals representative of a region of interest;

data acquisition circuitry configured to acquire the plurality of signals;

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data processing circuitry configured to receive process the plurality of signals;

system control circuitry configured to operate at least one of the imager and the data acquisition circuitry;

an operator workstation configured to communicate with the system control circuitry and to receive the processed plurality of signals from the data processing circuitry; and

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two or more sensor-based motion measurement systems, wherein each sensor-based motion measurement system is configured to measure electrical or non-electrical activity indicative of the motion of one or more organs within the region of interest.

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32. The imaging system as recited in claim 31, further comprising one or more positional sensors configured to activate one or more non-electrical sensors of a non-electrical sensor-based motion measurement system based on the position of the one or more non-electrical sensors relative to the imager.

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33. The imaging system as recited in claim 31, further comprising one or more positional sensors configured to activate two or more electrical sensors of an electrical sensor-based motion measurement system based on the position of the two or more electrical sensors relative to the imager.

34. The imaging system as recited in claim 31, wherein at least one sensor-based motion measurement system is configured to measure electrical activity indicative of the motion of two or more organs via two or more electrical sensors.

5 35. The imaging system as recited in claim 31, wherein at least one sensor-based motion measurement system is configured to measure non-electrical activity indicative of the motion of two or more organs via one or more non-electrical sensors.

10 36. The imaging system as recited in claim 35, wherein the one or more non-electrical sensors comprise accelerometers, optical markers, displacement sensors, force sensors, ultrasonic sensors, strain gauges, photodiodes, and pressure sensors.

37. An imaging system, comprising:

15 means for acquiring a set of motion data for two or more organs from at least one of one or more types of electrical sensors and one or more types of non-electrical sensors;

means for processing the set of motion data to extract two or more prospective gating points for an organ of interest; and

20 means for acquiring a set of image data representative of the organ of interest using the two or more prospective gating points.

38. An imaging system, comprising:

25 means for acquiring a set of motion data for one or more organs from at least two of one or more types of electrical sensors and a one or more types of non-electrical sensors;

means for processing the set of motion data to extract two or more prospective gating points for an organ of interest; and

30 means for acquiring a set of image data representative of the organ of interest using the two or more prospective gating points.

39. An imaging system comprising,

an imager configured to generate a plurality of signals representative of a region of interest;

data acquisition circuitry configured to acquire the plurality of signals;

data processing circuitry configured to process the plurality of signals;

5           system control circuitry configured to operate at least one of the imager and the data acquisition circuitry based upon two or more prospective gating points derived from a set of motion data describing the motion of two or more organs within the region of interest;

10           an operator workstation configured to communicate with the system control circuitry and to receive the processed plurality of signals from the data processing circuitry; and

a sensor-based motion measurement system configured to measure electrical or non-electrical activity indicative of the motion of at least one of the two or more organs within the region of interest to contribute to the set of motion data.

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40.    An imaging system comprising,

an imager configured to generate a plurality of signals representative of a region of interest;

data acquisition circuitry configured to acquire the plurality of signals;

20           data processing circuitry configured to process the plurality of signals;

system control circuitry configured to operate at least one of the imager and the data acquisition circuitry based upon two or more prospective gating points derived from a set of motion data describing the motion of at least one organ within the region of interest;

25           an operator workstation configured to communicate with the system control circuitry and to receive the processed plurality of signals from the data processing circuitry; and

30           a sensor-based motion measurement system configured to contribute to the set of motion data by measuring electrical or non-electrical activity indicative of the motion of the at least one organ within the region of interest via at least two of one or more types of electrical sensors and one or more types of non-electrical sensors.